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Title of Invention: Light-reflecting Projection Screen

Summary of Features & Objects of Invention

The present invention relates to a projection screen having a structure in which a lot of fine rectangular prisms are continuously attached on one surface of a visual field-focusing lens, and an object of the present invention is to provide a light-reflecting projection screen which totally reflects the light emitted from a projector and refracts and transmits the harmful light reached from other directions, so that a projection in daylight or in a bright room is practicable when a magnifying projection is made at a short distance.

Brief Description of Drawings

The drawings are enlarged views of an embodiment of the present invention. Figure 1 is a sectional view showing the structure of a light-reflecting projection screen according to the present invention and the position of a projector. Figure 2 is a greatly enlarged sectional view for explanation of its optical function. Figure 3 shows the visual angle (visible range) of a projection screen according to the present invention.

Detailed Description of Invention

The detailed description of the present invention will be made using the drawings. In Figure 1, the sign 1 designates an isosceles prism having a vertical angle of 90° and the sign 2 designates a visual field-focusing lens. The prism is attached by its base onto the back face of the visual field-focusing lens 2.

The position at which a projector 4 is settled corresponds to the focus of the visual field-focusing lens. In a practical projection, it causes great inconvenience that the surface of the screen has a large radius of curvature [t: a sharp curvature] as shown by the sign of 2. It is, therefore, necessary to use a Fresnel lens which takes in only the curved surface of the visual field-focusing lens and is formed flat as shown by the sign of 3.

The Fresnel lens is quite equal to the visual field-focusing lens shown by a dotted line in its functional effect.

The functional effect of the projection screen according to the present invention will be explained using Figure 2. Since the projector 4 is settled at the focus of the visual field-focusing lens 3, the projection light emitted therefrom is refracted in the exactly vertical direction to the plane of the screen by the visual field-focusing lens 3, then enters into the rectangular isosceles prism 1 attached on the rear side thereof, and is reflected again in the projected direction based on totally reflecting function of the rectangular prism.

That is, as shown in the figure, the projection light ray A is made exactly vertical and exactly parallel at the point (a) based on the refractivity of the visual field-focusing lens, then totally reflected by the hypothenuse of the rectangular prism at the points (b) and (c), and is thereafter refracted again in the projected direction at the point (d) in the visual field-focusing lens.

On the other hand, the light ray A' reached from a direction other than the focus of the visual field-focusing lens 3 (i.e., harmful light other than the projecting light) is not refracted in the vertical direction to the plane of the screen by the visual field-focusing lens 3. Therefore, the light ray A' cannot be totally reflected by the hypothenuse of the rectangular isosceles prism, but it is merely refracted and goes out backward.

That is, as shown in the figure, the light ray A' reached from a direction other than the focus of the visual field-focusing lens is not refracted in the vertical direction to the plane of the screen at the point (a') and arrives at the point (b'), where it is refracted and goes out

of the rear face of the screen.

The reason why, in general, a projection is not practicable in the daytime is because a projected image is extinguished by the external light incident from the side which is stronger than the projecting light. Accordingly, if it is possible to reflect only the projecting light and to remove the other light, a projection in the daytime will be practicable.

The present invention makes it possible that only the projecting light is reflected and the external light other than the projecting light is transmitted and removed on the rear side of the screen, so that a projection in the daytime becomes practicable without extinguishment of the reflected image.

The visual angle (visible range) of the present projection screen is an angle between the extensions of the segments PA and PB which connect the projector P with both ends of the projection screen S, as shown in the diagrams 1 and 2 of Figure 3, because the reflected light returns in the same direction as the projecting light. That is, an image is viewable within the range of ∠A'PB', and particularly the best effect can be achieved in the vicinity of the point P. The diagram 2 illustrates the case of a much more magnifying projection with a shorter focal distance as compared with those of the diagram 1, where the visual angle (∠A'PB') is larger than that of the diagram 1. Thus, a projection screen according to the present invention has an advantage that the magnification factor of a magnifying projection is larger, the visual angle therein is larger.

Claim

A structure of a projection screen characterized in that a lot of fine rectangular prisms are continuously mounted with the bases thereof being contacted onto the rear surface of a visual field-focusing lens, wherein only the projecting light emitted from a projector which is settled at the focus of the visual field-focusing lens is totally reflected and harmful light other than the projecting light is refracted and transmitted.

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（全3頁）

反射型光映寫板

發明の性質及目的の要領

本發明は視野集光レンズの一面に微細なる直角プリズムを無數に連接して附着せしめた構造を有する映寫板にして、その目的とする所は映寫器より發する映寫光線を全反射し、他方向より來る有害光線は屈折透過し、近距離より擴大映寫する場合、晝間又は明るき室内に於て映寫可能なる反射型光映寫板を得るにあり。

圖面の略解

圖面は本發明の實施例を示す擴大圖である。第1圖は本反射型光映寫板の構造を示す斷面圖、及び映寫器の位置を示し、第2圖は光學的作用を示すために著しく擴大した說明斷面圖である。第3圖は本映寫板の視角（可視範圍）を示す說明圖である。

發明の詳細なる說明

圖面につき本發明の詳細なる說明をなす。第1圖の1は頂角90度なる二等邊プリズム、2は視野集光レンズであり、このプリズムはその底邊を視野集光レンズ2の背面に接して附着せしめたものである。

映寫器4の置かれたる位置は視野集光レンズの焦點である。實際の映寫に際して2の如くスクリーン面が大きな曲率半徑を有することは多くの不便があるので、この視野集光レンズの曲面のみを生かし3に示す如く平面化フレネルレンズとすることが必要である。

その效果に於ては點線に示す視野集光レンズと全く同一である。

本映寫板の效果を第2圖につき說明するに映寫器4は視野集光レンズ3の焦點に置かれてあるからこれより發する映寫光線は視野集光レンズ3によりスクリーン面に對し完全なる垂直方向に屈折され裏面の直角二等邊プリズム1に入射し、直角プリズムの全反射作用により再び映寫方向に反射される。

即ち圖示の如く映寫光線Aはa點にて視野集光レンズの屈折により完全垂直、完全平行となり、b、c點に於て直角プリズム斜邊により全反射された後、視野集光レンズのd點より再び映寫方向に屈折される。

然るに視野集光レンズ3の焦點以外より來る光線（即ち映寫光線以外の有害光線）は視野集光レンズ3によりてスクリーン面に垂直方向に屈折されないから、直角二等邊プリズムの斜邊によつて全反射されず、單に屈折されるのみにて背面に逸出する。

即ち視野集光レンズの焦點以外よりの光線A'はa'點に於てスクリーン面に垂直方向に屈折されることなくb'點に達し屈折されてスクリーンの裏面に逸出する。

一般に晝間映寫を不可能にするのは映寫光線よりも側面からの外光の方が强い爲めに映像が消されてしまうからである。從つて映寫光線のみを反射しそれ以外の光線を除去できれば晝間映寫が可能となるわけである。

本發明は映寫光線のみを直角プリズムの全反射により反射し、映寫光線以外の外光はスクリーンの背面に透過せしむることによつて除去し、何ら反射映像を消すことなく晝間映寫を可能にしたものである。

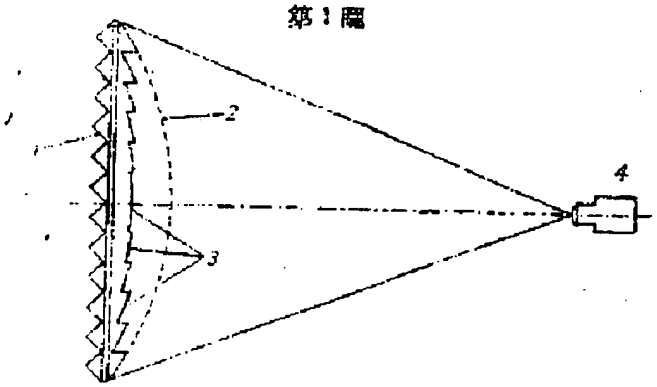
本映寫板の視角（可視範圍）は、その反射光線は映寫光線と同方向に戻るを以つて、第3圖イ、ロに示す如く、映寫器Pと本映寫板Sの兩端を結ぶ線分PA及びPBの延長によつて作られる角度である。即ち∠A'PB'の範圍内に於て映像を見ることを得、特にP點の附近近くに於て最上の效果が得られる。ロ圖はイ圖に比し、更に短焦點にて著しく擴大映寫の場合にして、その視角（∠A'PB'）がイ圖より大なるを示す。即ち映寫擴大

率が大なる程、その視角を大となし得るは、本映寫板の特長である。

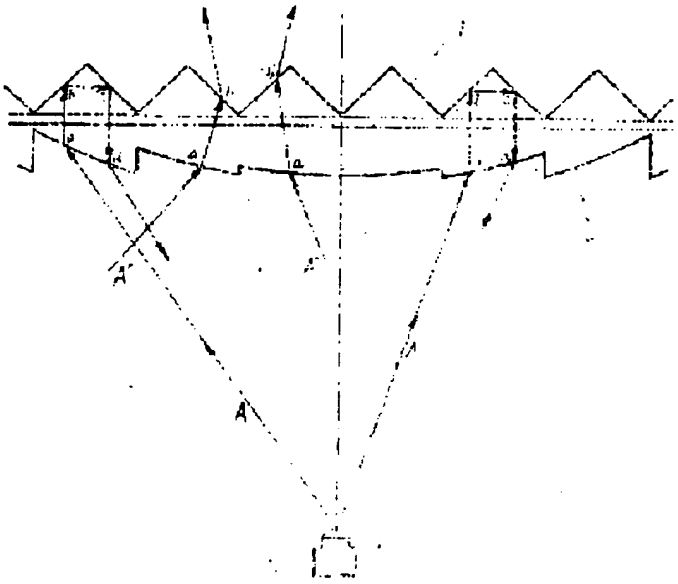
特許請求の範圍

視野集光レンズの背面に、その底邊を接して無數の微小な直角プリズムを連續に設け、視野集光レンズの焦點に置かれた映寫器よりの映寫光線のみを全反射し、映寫光線以外の有害光線は屈折透過せしめることを特徴とする螢光映寫板の構造。

第1圖



第2圖



第3圖